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threads or tubules, indicating an evolutionary approach toward the genus *Siphoptychium*.

For these structural reasons, and also by reason of analogous development, the genus *Siphoptychium*, notwithstanding its present position in the classification of its author, has been treated in this paper as allied to the genus *Tubulina*.

Philadelphia.

Notes upon *Peronosporæ* for 1890.

BYRON D. HALSTED.

The season just closing has been a moderately wet one in New Jersey, but the excess of rainfall did not equal that of last year. This statement that we have had two succeeding wet years is an important one in this connection. All of the ordinary forms of the order *Peronosporæ* have been abundant, and only a word will be said of a few of the leading species, as there are a number of new hosts for old forms and some species new to America to be herein recorded.

Phytophthora infestans D'By., causing the wet rot of the white potatoes, has been most strikingly destructive this autumn, especially in the southern counties of the state. So abundant has it been that thousands of acres that otherwise would have yielded a large crop will not be dug at all. Slices of the rotting potatoes placed in moist chambers developed the conidiophores and spores in four hours. This gives some idea of the rapidity with which this fungus runs its course, always a surprise as well as source of dismay to the growers.

The *Phytophthora Phaseoli* Thax., first found last season by Dr. Thaxter in Connecticut, has been frequently looked for but not obtained upon any sort of cultivated bean. This new member of the small genus may as yet be quite local in its range, but is expected in sight at any time.

Plasmopara viticola (B. & C.) Ber. & DeT., has been abundant upon the grape. In one vineyard where hundreds of clusters had been ruined by this mildew, after a long search none could be found upon the leaves. This is so unusual that it is worthy of notice. In this connection it may be said that specimens of succulent galls of the stem and leaf-stalks were sometimes found completely covered with the *Plasmopara*, while other parts were entirely free. This indicates that the soft gall tissue furnishes better conditions

for the growth of the mildew than the ordinary stem or leaf. The same mildew has been common upon the *Ampelopsis tricuspidata*, causing the portions of the attached leaves to turn a rich red upon the upper side as if prematurely ripening. While at Liberty, New York, the *Plasmopara* was found in abundance upon a cultivated plant of *Ampelopsis quinquefolia* growing upon a trellis with no grape vines or other Virginia creeper plants within a long distance. No signs of the mildew were upon the fruit. A few plants growing upon the ground in a wood lot at Cold Spring Harbor, Long Island, had nearly every leaf attacked, and here as noted for the *A. tricuspidata* the foliage had turned in early July to a beautiful rich red color. The coloration was so strong and constant that it served as a guide in collecting specimens.

Abundant specimens of *Plasmopara entospora* Schroet. were found in early May upon *Erigeron Canadense*, which was the first time the writer had succeeded in taking this peculiar and abbreviated species.

Plasmopara Geranii (Pk.) Berl. is becoming the most common species in the vicinity of New Brunswick, especially upon the *Geranium Carolinianum*, which it covers in early spring. It establishes itself upon the seedlings of this winter annual in late autumn. No oöspores seem to form in this host and there is no particular reason for their presence as the mildew passes the winter in the tissue of the host which is better than in the form of oöspores.

Bremia Lactuæ Regel (*Peronospora gangliiformis* D'By.) was abundant upon *Lactuca Canadensis* in some parts of the state, and weakened materially the vigor if not shortened the life of this weed. However, in the greenhouses it worked some damage to the lettuce crop during the winter months.

Peronospora parasitica D'By. has a list of a score of hosts all in the same order (Cruciferae). It was found in early spring particularly abundant upon *Cardamine hirsuta* and *C. laciniata*. On May 17th, it was met with upon the leaves of *Hesperis matronalis* and several times afterwards upon the same host, which as far as determined is a new one to America. In like manner on June 4th it was taken upon many of the outer leaves of the common cabbage. No mention of this host is made by American writers upon the order.

Peronospora Violæ D'By. did not prove so destructive to the cultivated violets as was feared last winter, and diseased plants from several greenhouses fail now to confirm

any suspicions that the prevailing trouble is due to a *Peronospora*. It is only fair to give the *Peronosporas* in particular, and as a whole, their dues.

In this connection it may also be noted that while last year there was a fair abundance of the rare *Peronospora Cubensis* B. & C., that ruined the crops of hot-house cucumbers in this locality and was found upon field-squash, pumpkins and cucumbers generally, during the present season it has almost failed to appear. This is a surprising fact, for with the wet season it was predicted that this *Peronospora* would be widespread. No oöspores have yet been found and their absence in a species that preys upon short-lived annuals in our climate may help to explain the coming and going of this shy mildew.

Peronospora effusa Rabenh. was to be found quite generally upon the cultivated spinach, but it was not the cause of the most serious of the fungous troubles of that crop.

Peronospora Ficariæ Tul., which is recorded upon several crowfoots, was met with May 6th abundant upon an apparently new host, namely, *Ranunculus abortivus* and with oöspores.

Peronospora alta Fl. heretofore has only been recorded upon *Plantago major* and *P. lanceolata*. During May and June it was unusually abundant upon *Plantago Virginica*, causing the plants to become dwarfed and turn of a sickly yellow. Oöspores were present.

A *Peronospora* new to this country is *P. obovata* Bonord, found upon *Spergula arvensis* at Liberty, N. Y. Unlike most members of the genus, this prefers the stem of the host, and appearing in patches of an inch or less in length, it often weakens the stem so much as to cause it to bend. In like manner it often appears upon a few of the peduncles of the loose inflorescence, causing the infested portions to thicken and remain shorter than the normal ones. On account of this habit it is easy to detect the presence of the mildew. Another sign of the *Peronospora* is quite constant upon all old infested spots; it consists in the development of a black mould (*Macrosporium parasiticum* Thüm.), which appears nowhere else upon the host, and seems to be strictly parasitic upon the mildew. This matter will receive further attention as time affords an opportunity. The species is particularly well named, as the conidia are distinctly obovate. The oöspores are much like those of other species and not characteristic of this one. It may be said in passing that with the *Peronospora* there is usually upon the same host

an abundance of *Puccinia Spurgulae* DC., a species of rust not before recorded in this country. The host, a European plant, is as yet only locally known as a pestiferous weed, and thus there are at least two active fungi which probably came with it from abroad, and we trust will tend to check its spread in America.

Perhaps the most interesting of the peronosporaceous finds during the year has been that of *Peronospora Rubi* Rabenh., seen first on May 27th sparingly upon *Rubus occidentalis* in a garden near New Brunswick, and afterwards (July 10th–20th) in abundance upon *Rubus villosus* var. *humifusus* at Cold Springs Harbor, Long Island. Upon the downy under surface of the black-cap leaves the *Peronospora* is not conspicuous, in fact, the species was found by accident while searching with the microscope for the cause of a peculiar curling and browning of the leaves. In appearance, on the other hand, the attacked foliage of the *R. villosus* is quite striking, having a rich red discoloration of the upper surface, as if ripening, a fact that has been mentioned above for *P. viticola* upon the leaves of the two *Ampelopsis* hosts.

The *Peronospora obovata* we can welcome, as it preys upon a weed, but with the species upon the genus *Rubus* it must be otherwise. As yet we have not suffered from it, but only recall the nature of the close kin of this mildew and bear in mind the fact that all the genus *Rubus* are so nearly related that when one is attacked by rust or anthracnose, all are liable to suffer, and it becomes evident that in *Peronospora Rubi* we may have a serious enemy to our blackberries, raspberries and blackcaps that could add a heavy load to the already great burden of plant diseases that the small fruit grower is forced to bear. It is in such cases as this that a law for the destruction of fungi could be operative and effective. It may be that the *Rubus Peronospora* is only to be found in a few places, and therefore could be exterminated at little expense. But when once it has spread through the fruit gardens it will be an enemy demanding attention like the one upon the grape.

Of the genus *Cystopus* only a brief note is called for here. Until very recently the oöspores of *Cystopus Ipomææ-panduratae* Farl. have been looked for in vain. As Dr. Farlow predicted, they were found in the stem of the host. During the present summer, while in the field studying the diseases of the sweet potato, this white mould was found abundant upon the leaves, but in no case were the oöspores met with upon this host. In adjoining fields of corn, however, large quan-

tities of *Ipomœa pandurata* were found with all parts distorted almost out of recognition with galls in which the oöspores made up the greater part of the swollen masses.

Mycologists and others are welcome to specimens of the various species mentioned in these notes.

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Notes on the flora of the Lake Superior region. IV.

E. J. HILL.

At Tower I found my first specimen of *Geum macrophyllum*. It is by no means common in our region. Wheeler and Smith say of it for Michigan: "Rare or not at all in the Lower Peninsula." Upham states that it is abundant north of Lake Superior, where Agassiz also gives it in his work on Lake Superior. It has been found by Dr. Vasey in northern Illinois.

Pretty forms of *Circæa alpina* were seen in its characteristic localities. The flowers were tinged with red. The pedicels of the flowers and the rachis of the raceme were thickly covered with glandular hairs. Reddish flowers are known to occur in this species, and it seems to approach in this respect its congener, *C. Lutetiana*.

In the wet grassy grounds, and open grassy woods, was obtained a somewhat unusual form of *Campanula aparinoides*. It first attracted attention by the color of the flowers and their large size for the species. All were bluish-white, changing to a decided blue on drying. Plants seen about Chicago are nearly always white, though some are tinged or faintly striped with blue, and also become more deeply colored as they dry. The corolla of the Minnesota specimens was from three to four times the length of the calyx lobes. The stems were of ordinary height, but freely branched in a paniculate manner. Nor are the stems of the plants found in this vicinity simple, as they are described in many of our books; they are really branched, and bear a single flower at the end of each leafy branch that is from two to six inches long. This ends in a slender peduncle, but it is provided with leaves like those of the main stem, diminishing in size as the flower is approached. But the branches do not often divide, and the stem is racemosely branched. Wood i more accurate in the description of the plants as I find them, since he characterizes the stems as "branched above." In the